CLAIMS

What is claimed is:

1. A method for characterizing a drilling hazard in a proposed wellbore, comprising:

determining a well plan including at least a wellbore trajectory;

estimating a likelihood of occurrence of, a position along the trajectory and a severity of consequences of at least one drilling hazard; and

displaying on a representation of at least a portion of the wellbore trajectory, at least one of the position of, the likelihood and the severity of the at least one drilling hazard.

2. The method as defined in claim 1 wherein the estimating the position, likelihood and severity is performed by determining a Bayesian uncertainty thereof based on a correlation of the well plan to a model of earth formations along the wellbore trajectory.

3. The method as defined in claim 2 wherein the earth model is generated from at least one of offset wellbore data, seismic survey data and correlative wellbore data from similar earth formations distal from a location of the proposed wellbore.

4. The method as defined in claim 1 further comprising:

adjusting at least one well plan parameter;

recalculating at least one of the position, the likelihood and the severity of the at least one drilling hazard; and

repeating the displaying.

5. The method as defined in claim 4 further comprising:

repeating the adjusting and recalculating until at least one of a most likely cost to drill a wellbore, an estimated amount of lost time and a likelihood of encountering the at least one drilling hazard is minimized.

6. The method as defined in claim 4 wherein the at least one well plan parameter comprises one of casing depth, dog leg severity, and mud weight.

7. The method as defined in claim 4 wherein the at least one well plan parameter includes at least one drilling operating parameter.

8. The method as defined in claim 7 wherein the at least one drilling operating parameter comprises at least one of weight on bit and rotary speed.

9. The method as defined in claim 1 wherein the at least one drilling hazard comprises at least one of stuck pipe, lost circulation, taking a kick and BHA component failure.

10. The method as defined in claim 1 wherein the displaying comprises presenting a graphic cylinder on the representation at the position, a diameter of the cylinder related to the likelihood, a length of the cylinder related to the severity and a color of the cylinder related to a type of the at least one drilling hazard.

11. The method as defined in claim 1 wherein the displaying comprises presenting with respect to depth in the wellbore at least one of a color coded and shade coded indicator, the indicator corresponding to one of the likelihood of and the severity of the drilling hazard.

12. The method as defined in claim 11 further comprising a reference indicator disposed proximate to the at least one of the color coded and shade coded

indicators, the reference indicator tied to a textual description of at least the type of drilling hazard.

13. A method for optimizing a well plan for a proposed wellbore, comprising:

selecting an initial well plan comprising at least a wellbore trajectory;

determining for the initial well plan a position along the trajectory, a likelihood of occurrence, and a severity of consequence of encountering at least one drilling hazard;

adjusting at least one parameter of the initial well plan;

redetermining the position, likelihood and severity of the at least one drilling hazard; and

repeating the adjusting and redetermining until at least one of a most likely cost to drill a wellbore, an amount of lost time and a likelihood of encountering the at least one drilling hazard is minimized.

14. The method as defined in claim 13 wherein the determining and the redetermining the position, likelihood and severity are performed by determining a Bayesian uncertainty thereof based on a correlation of the well plan on a model of earth formations along the wellbore trajectory.

15. The method as defined in claim 14 wherein the earth model is generated from at least one of offset wellbore data, seismic survey data and correlative wellbore data from similar earth formations distal from a location of the proposed wellbore.

16. The method as defined in claim 13 wherein the at least one well plan parameter comprises one of casing depth, dog leg severity, and mud weight.

17. The method as defined in claim 15 wherein the at least one well plan parameter includes at least one drilling operating parameter.

18. The method as defined in claim 15 wherein the at least one drilling operating parameter comprises at least one of weight on bit and rotary speed.

19. The method as defined in claim 1 wherein the at least one drilling hazard comprises at least one of stuck pipe, lost circulation, taking a kick and BHA failure.

20. The method as defined in claim 13 further comprising displaying in graphic form at least one of the position, likelihood and severity of the at least one drilling hazard for evaluation by a system operator.

21. The method as defined in claim 20 wherein the displaying comprises presenting a graphic cylinder on the representation at the position, a diameter of the cylinder related to the likelihood, a length of the cylinder related to the severity and a color of the cylinder related to a type of the at least one drilling hazard.

22. The method as defined in claim 20 wherein the displaying comprises presenting with respect to depth in the wellbore at least one of a color coded and shade coded indicator.

23. A method for drilling a well, comprising
selecting an initial well plan comprising at least a wellbore trajectory;
starting drilling the well according to the initial well plan;

measuring at least one of a drilling operating parameter and an earth formation characteristic during the drilling;

determining at least one of a position along the trajectory, a likelihood of encountering and a severity of occurrence of at least one drilling hazard in response to the measuring;

adjusting at least one parameter of the initial well plan for an unfinished portion of the well;

redetermining the position, likelihood and severity of the at least one drilling hazard;

repeating the adjusting and redetermining until for the unfinished portion of the well at least one of a most likely cost to drill, an amount of lost time and a likelihood of encountering the at least one drilling hazard is minimized; and

drilling the unfinished portion of the well according to the adjusted well plan.

24. The method as defined in claim 23 wherein the determining and redetermining the position, likelihood and severity are performed by determining a Bayesian uncertainty thereof based on a correlation of the initial well plan to a model of earth formations along the wellbore trajectory.

25. The method as defined in claim 24 wherein the earth model is generated from at least one of offset wellbore data, seismic survey data and correlative wellbore data from similar earth formations distal from a location of the proposed wellbore.

26. The method as definer in claim 25 wherein the earth model is redetermined using data from the measuring, and the Bayesian uncertainty is determined by correlating the adjusted initial well plan to the redeterdmined earth model.

27. The method as defined in claim 23 wherein the at least one well plan parameter comprises one of casing depth, dog leg severity, and mud weight.

28. The method as defined in claim 23 wherein the at least one well plan parameter includes at least one drilling operating parameter.

29. The method as defined in claim 28 wherein the at least one drilling operating parameter comprises at least one of weight on bit and rotary speed.

30. The method as defined in claim 23 wherein the at least one drilling hazard comprises at least one of stuck pipe, lost circulation, taking a kick and BHA failure.

31. The method as defined in claim 23 further comprising displaying in graphic form the position, likelihood and severity of the at least one drilling hazard for evaluation by a system operator.

32. The method as defined in claim 31 wherein the displaying comprises presenting a graphic cylinder on the representation at the position, a diameter of the cylinder related to the likelihood, a length of the cylinder related to the severity and a color of the cylinder related to a type of the at least one drilling hazard.

33. The method as defined in claim 31 wherein the displaying comprises presenting with respect to depth in the wellbore at least one of a color coded and shade coded indicator.